

1 New claims

2 1. Method for controlling the operation of an electronic  
3 wheel unit (2) assigned to a vehicle wheel (1), comprising  
4 the following steps:

5  
6 Acquiring data in respect of the operating state of the  
7 wheel (1) by means of at least one state detection device  
8 (3);

9  
10 Acquiring data in respect of the energy instantaneously  
11 available to the electronic wheel unit (2) from a generator  
12 (5) and from an energy storage device (6) by means of at  
13 least one energy detection device (4, 4');  
14

15 Controlling the operation the electronic wheel unit (2) and  
16 the thereby determined energy consumption of the electronic  
17 wheel unit (2) as a function of the data acquired by the at  
18 least one state detection device (3) and the at least one  
19 energy detection device (4, 4') by means of a central  
20 control unit (9) connected to the at least one state  
21 detection device (3) and to the at least one energy  
22 detection device (4, 4'); and  
23

24 Ensuring a functionality of the electronic wheel unit (2)  
25 during predetermined important operating states of the wheel  
26 (1) that at least temporarily consumes more energy than is  
27 instantaneously available from the generator (5), and a  
28 functionality of the electronic wheel unit (2) during  
29 predetermined less important operating states of the wheel  
30 (1) that is reduced below the degree available from the  
31 available energy of the generator (5), in order that the  
32 generator (5) charges up the energy storage device (6) to

1 compensate for energy previously over-consumed or to be  
2 over-consumed.

3  
4 2. Method according to claim 1,  
5 characterized in that the electronic wheel unit (2) is  
6 directly connected to the energy storage device (6) for  
7 supplying it with energy.

8  
9 3. Method according to claim 1 or 2,  
10 characterized in that the energy storage device (6) is  
11 disposed between the generator (5) and the electronic wheel  
12 unit (2).

13  
14 4. Method according to at least one of the preceding  
15 claims,  
16 characterized in that the energy storage device (6) is  
17 implemented using charging electronics (7) for suitable  
18 conversion and conditioning of the signals received from the  
19 generator (5).

20  
21 5. Method according to at least one of the preceding  
22 claims,  
23 characterized in that the energy storage device (6) is  
24 implemented as a rechargeable battery, capacitor, gold cap  
25 capacitor, a foil battery incorporated in a circuit board,  
26 or the like.

27  
28 6. Method according to at least one of the preceding  
29 claims,  
30 characterized in that there are provided a plurality of  
31 state detection devices (3) for acquiring data in respect of  
32 accelerations, vibrations, noise, forces, movements,  
33 temperatures, pressures, etc. of the associated wheel (1).

1  
2 7. Method according to at least one of the preceding  
3 claims,  
4 characterized in that there are provided a plurality of  
5 energy detection devices (4, 4') for detecting the  
6 instantaneously available energy of the generator (5) and  
7 the instantaneous utilization state of the energy storage  
8 device (6).

9  
10 8. Method according to at least one of the preceding  
11 claims,  
12 characterized in that the central control unit (9) receives  
13 and evaluates data in respect of the following operating  
14 states from the at least one state detection device (3)  
15 and/or the at least one energy detection device (4, 4'):  
16 start of driving, e.g. a defined time interval after moving  
17 off; initialization, whereby an initialization procedure is  
18 executed e.g. on the vehicle receiver; localization, whereby  
19 a localization procedure is executed e.g. on the vehicle  
20 receiver; a risk state, e.g. for a below-threshold pressure  
21 and/or an above-threshold speed of a wheel (1); a danger  
22 state, e.g. for greatly below-threshold pressure of the  
23 wheel (1); charging state of the energy system, e.g. for  
24 high available energy at the output of the generator (5)  
25 and/or a low fill level of the energy storage device; or the  
26 like.

27  
28 9. Method according to at least one of the preceding  
29 claims,  
30 characterized in that the central control unit (9) controls  
31 the following responses of the electronic wheel unit (2) as  
32 a function of the acquired data: the transmitting frequency  
33 of the electronic wheel unit (2); the measurement frequency

1 of the electronic wheel unit (2); the repetition frequency  
2 of a radio telegram to improve transmission reliability; the  
3 accuracy of the measurements of the electronic wheel unit  
4 (2); selecting which measurements are to be performed by the  
5 electronic wheel unit (2); transition to or from a power  
6 saving mode of the electronic wheel unit (2); connection of  
7 the electronic wheel unit (2) to the energy storage device  
8 (6); adaptation or selection of the transmitted data, e.g.  
9 the telegram is reduced to the most necessary core data for  
10 energy saving (only identifiers and possibly additional  
11 pressure and temperature data), whereas without the need to  
12 save energy all the sensor data together with calibration  
13 and manufacturing data is transmitted; or the like.

14  
15 10. Method according to at least one of the preceding  
16 claims,  
17 characterized in that the central control unit (9) is  
18 connected to the electronic wheel unit (2) via a radio link.

19  
20 11. Method according to at least one of the preceding  
21 claims,  
22 characterized in that the plurality of state detection  
23 devices (3) and/or the plurality of energy detection devices  
24 (4, 4') are implemented as passively operated sensors.

25  
26 12. Method according to at least one of the preceding  
27 claims,  
28 characterized in that the generator (5) is implemented as an  
29 energy transducer.

30  
31 13. Apparatus for controlling the operation of an  
32 electronic wheel unit (2) assigned to a vehicle wheel (1)  
33 with:

1  
2 at least one state detection device (3) for acquiring data  
3 in respect of the operating state of the wheel (1);

4  
5 at least one energy detection device (4, 4') for acquiring  
6 data in respect of the energy instantaneously available to  
7 the electronic wheel unit (2) from a generator (5) and from  
8 an energy storage device (6); and with

9  
10 a central control unit connected to the at least one state  
11 detection device (3) and to the at least one energy  
12 detection device (4, 4') for controlling the operation of  
13 the electronic wheel unit (2) and the thereby determined  
14 energy consumption of the electronic wheel unit (2) as a  
15 function of the data acquired by the at least one state  
16 detection device (3) and the at least one energy detection  
17 device (4, 4');

18  
19 wherein during predetermined important operating states of  
20 the wheel (1) the central control unit (9) ensures a  
21 functionality of the electronic wheel unit (2) which at  
22 least temporarily consumes more energy than is  
23 instantaneously available from the generator (5) and, during  
24 predetermined less important operating states of the wheel  
25 (1), reduces the functionality to below the degree available  
26 from the available energy of the generator (5) in order that  
27 the generator (5) charges up the energy storage device (6)  
28 to compensate for the energy previously over-consumed or to  
29 be over-consumed.

30  
31 14. Apparatus according to claim 13,

1 characterized in that the electronic wheel unit (2) is  
2 connected directly to the energy storage device (6) for  
3 supplying energy.

4  
5 15. Apparatus according to claim 13 or 14,  
6 characterized in that the energy storage device (6) is  
7 disposed between the generator (5) and the electronic wheel  
8 unit (2).

9  
10 16. Apparatus according to at least one of claims 13 to 15,  
11 characterized in that the energy storage device (6) is  
12 implemented with charging electronics (7) for appropriate  
13 conversion and conditioning and the signals received by the  
14 generator (5).

15  
16 17. Apparatus according to at least one of claims 13 to 16,  
17 characterized in that the energy storage device (6) is  
18 implemented as a rechargeable battery, capacitor, gold cap  
19 capacitor, a foil battery incorporated in a circuit board,  
20 or the like.

21  
22 18. Apparatus according to at least one of claims 13 to 17,  
23 characterized in there are provided a plurality of state  
24 detection devices (3) for acquiring data in respect of  
25 accelerations, vibrations, noise, forces, movements,  
26 temperatures, pressures, etc. of the associated wheel (1).

27  
28 19. Apparatus according to at least one of claims 13 to 18,  
29 characterized in that there are provided a plurality of  
30 energy detection devices (4, 4') for detecting the  
31 instantaneously available energy of the generator (5) and  
32 the instantaneous utilization state of the energy storage  
33 device (6).

1  
2 20. Apparatus according to at least one of claims 13 to 19,  
3 characterized in that the central control unit (9) receives  
4 and evaluates data in respect of the following operating  
5 states from the at least one state detection device (3)  
6 and/or the at least one energy detection device (4, 4'):  
7 start of driving, e.g. a defined time interval after moving  
8 off; initialization, whereby an initialization procedure is  
9 executed e.g. on the vehicle receiver; localization, whereby  
10 a localization procedure is executed e.g. on the vehicle  
11 receiver; a risk state, e.g. for a below-threshold pressure  
12 and/or an above-threshold speed of a wheel (1); a danger  
13 state, e.g. for greatly below-threshold pressure of the  
14 wheel (1); charging state of the energy system, e.g. for  
15 high available energy at the output of the generator (5)  
16 and/or a low fill level of the energy storage device; or the  
17 like.

18  
19 21. Apparatus according to at least one of claims 13 to 20,  
20 characterized in that the central control unit (9) controls  
21 the following responses of the electronic wheel unit (2) as  
22 a function of the acquired data: the transmitting frequency  
23 of the electronic wheel unit (2); the measurement frequency  
24 of the electronic wheel unit (2); the repetition frequency  
25 of a radio telegram to improve transmission reliability; the  
26 accuracy of the measurements of the electronic wheel unit  
27 (2); selecting which measurements are to be performed by the  
28 electronic wheel unit (2); transition to or from a power  
29 saving mode of the electronic wheel unit (2); connection of  
30 the electronic wheel unit (2) to the energy storage device  
31 (6); adaptation or selection of the transmitted data, e.g.  
32 the telegram is reduced to the most necessary core data for  
33 energy saving (only identifiers and possibly additional

1 pressure and temperature data), whereas without the need to  
2 save energy all the sensor data together with calibration  
3 and manufacturing data is transmitted; or the like.

4

5 22. Apparatus according to at least one of claims 13 to 21,  
6 characterized in that the central control unit (9) is  
7 connected to the electronic wheel unit (2) via a radio link.

8

9 23. Apparatus according to at least one of claims 13 to 22,  
10 characterized in that the plurality of state detection  
11 devices (3) and/or the plurality of energy detection devices  
12 (4, 4') are implemented as passively operated sensors.

13

14 24. Apparatus according to at least one of claims 13 to 24,  
15 characterized in that the generator (5) is implemented as an  
16 energy transducer.

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